

Present State of Preparedness for Oil Spill Response in Arctic Waters

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4th Symposium on the Impacts of an
Ice-Diminishing Arctic on Naval
and Maritime Operations



NOAA's Role in Spills

- Office of Response and Restoration (ORR) in National Ocean Service
- Provide Scientific Support and Services to US Coast Guard during Response
- Natural Resource Trustee
- Natural Resource Damage Assessment (NRDA)
- Restoration



Coastal Response Research Center (CRRC)

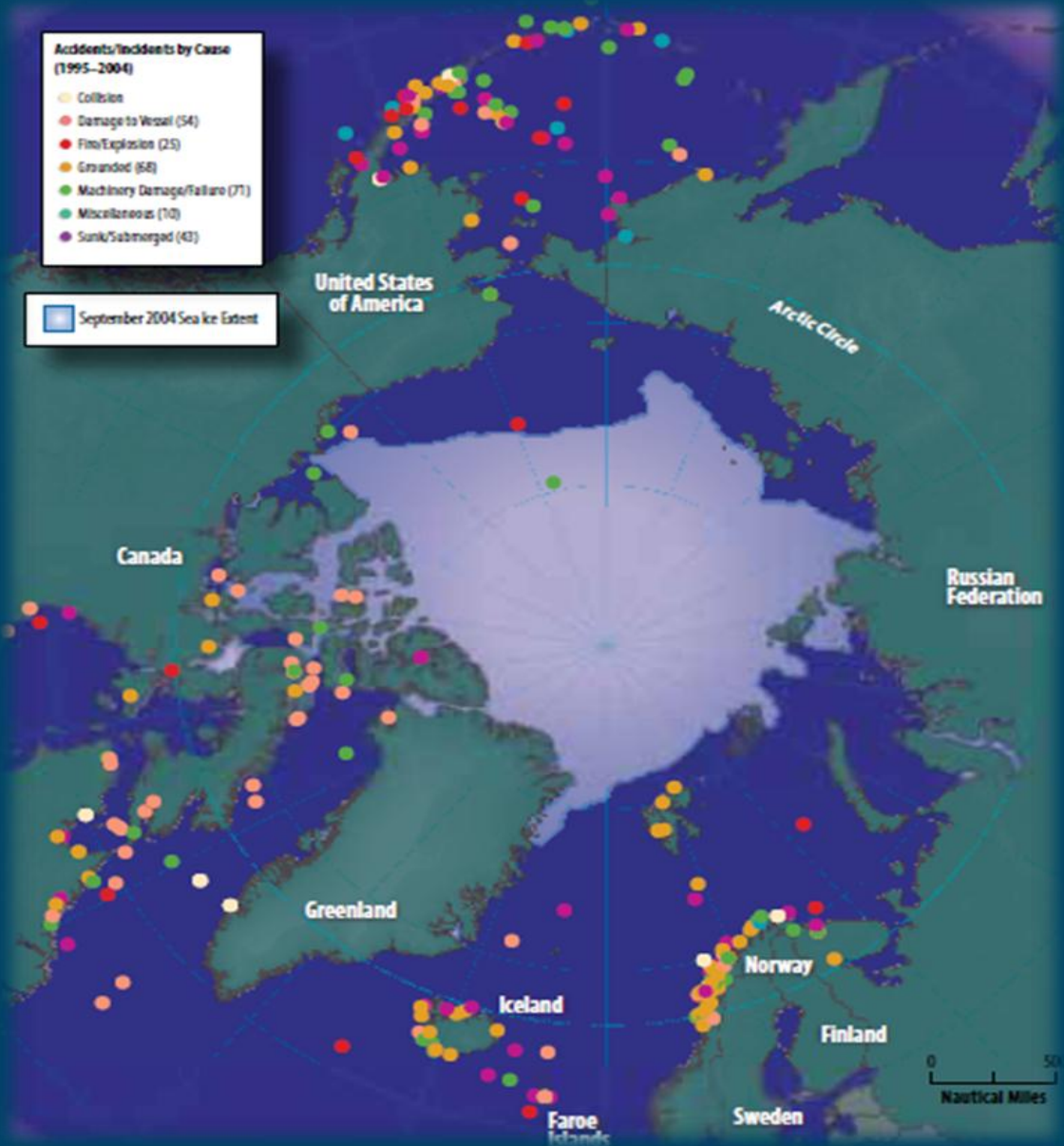
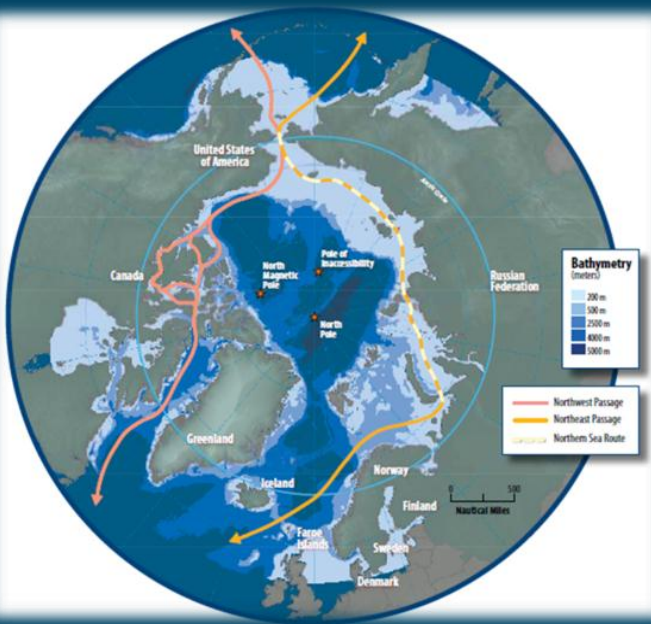
- NOAA ORR and Univ of NH Partnership Since 2004
- CRRC Mission:
- Conduct and Oversee **Basic** and **Applied** Research and Outreach on Spill Response and Restoration
- Transform Research **Results into Practice**
- Serve as **Hub for Oil Spill R&D**
- **Educate/Train Students** Who will Pursue Careers in Spill Response and Restoration



Focus on Uncontrolled Oil Releases

- Maritime Shipping Accidents
 - Single hulled vessels: freighters and cruise ships
- Oil and Gas Development & Production
 - Platform / Piping
 - Drilling
- Transport of Oil / Gas
 - Piping networks
 - Double hulled tankers/barges





1995-2004 >350 Accidents & Incidents

Conceptual Model of Arctic Oil Spill Exposure and Injuries (theoretical)

Wetlands, low coastal tundra, lagoons:

Provide refuge, nesting, and spawning areas. Highly productive.

OIL IMPACT

Oiled, degraded or eroding habitat reduces productivity.

Pelagic Zone

Productive area for food web

OIL IMPACT

Surface and dispersed oil affects food web. Fish eggs and larvae are especially sensitive.

Benthos

Can be highly productive, important in cycling nutrients

OIL IMPACT

Oil in sediments reduces productivity and affects food web

Top Predators

Marine mammal and bird populations are of global significance

OIL IMPACT

Oil can produce health effects and degrade food web

Ice Habitat

Seasonally important source of production, habitat for marine mammals

OIL IMPACT

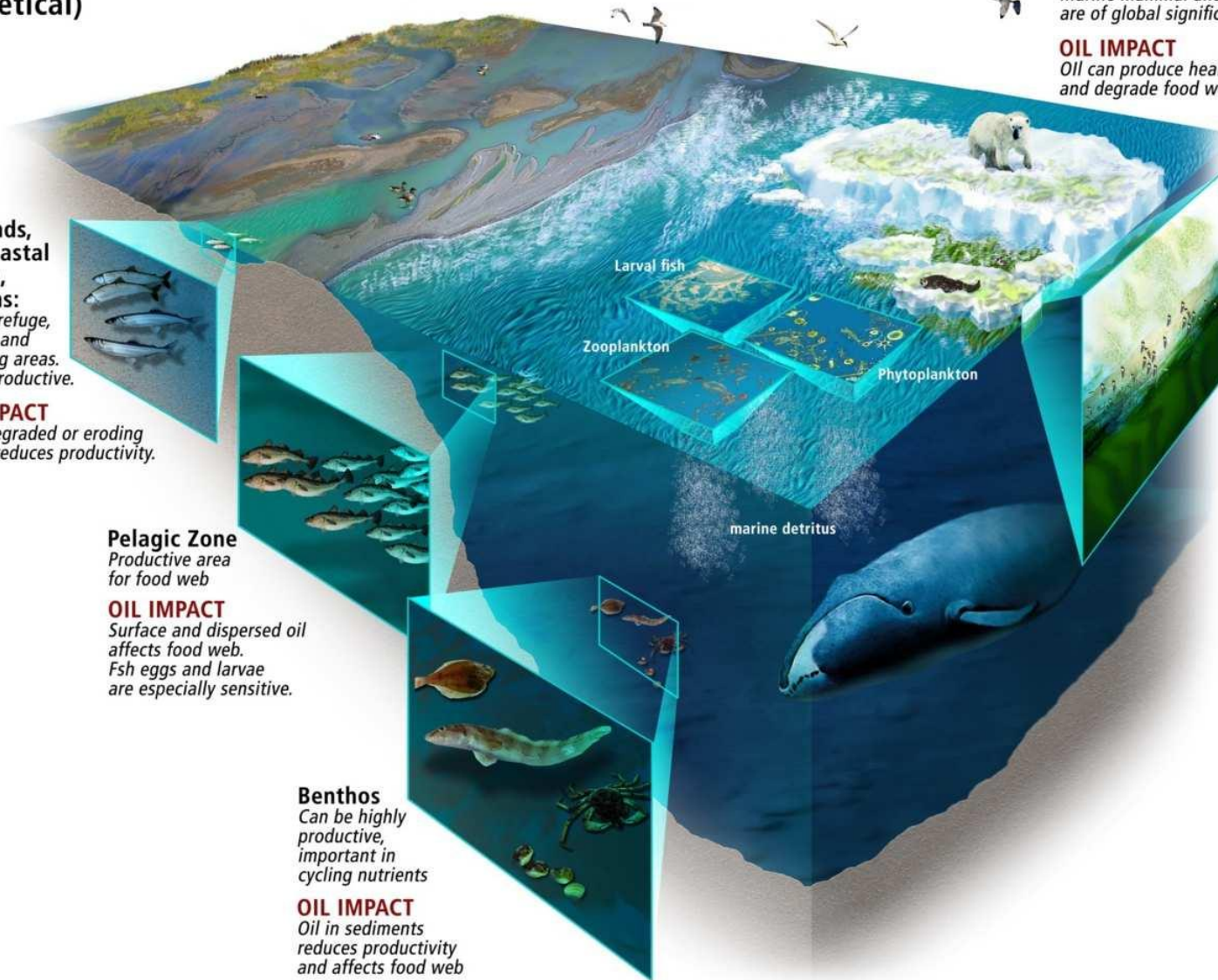
Sensitivity to oiling is poorly studied.

Larval fish

Zooplankton

Phytoplankton

marine detritus

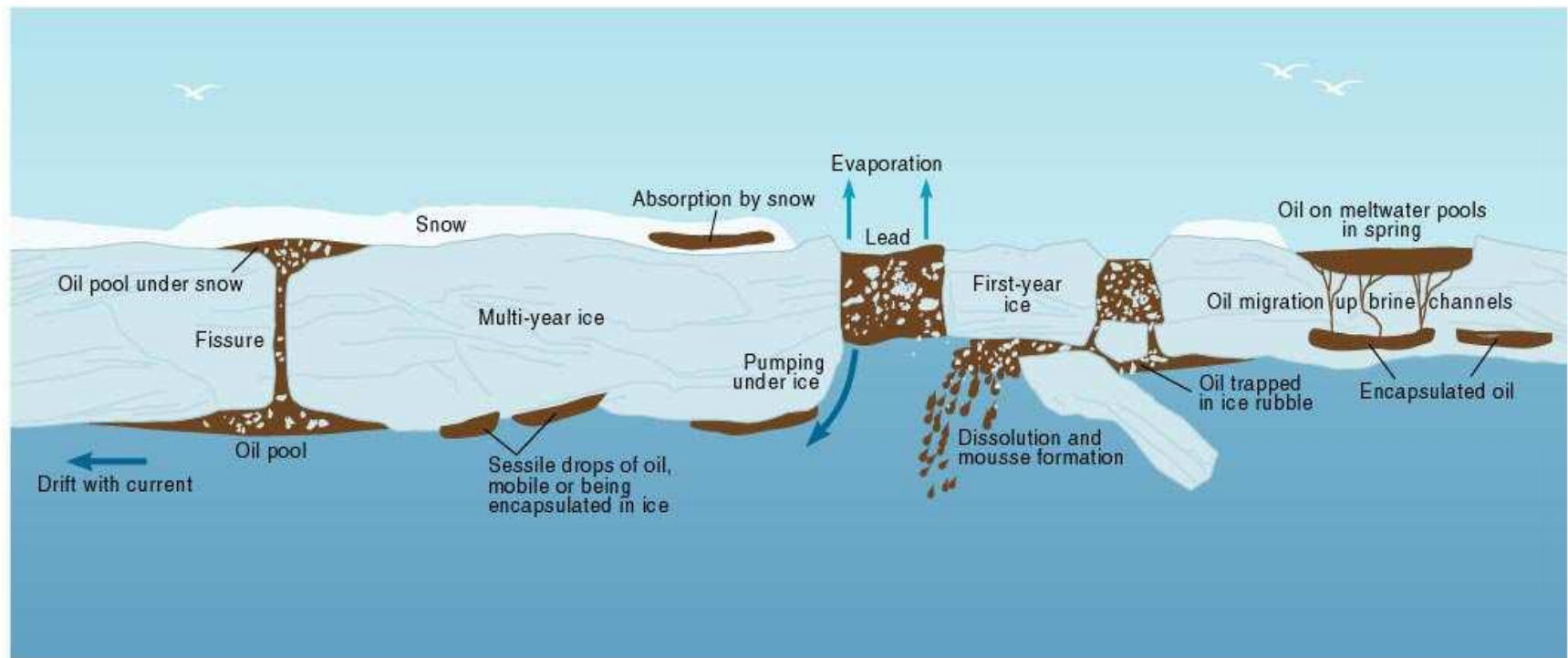


Conceptual Model of Oil-in-Ice



Arctic Monitoring and Assessment Programme

AMAP Assessment Report: Arctic Pollution Issues, Figure 10-5



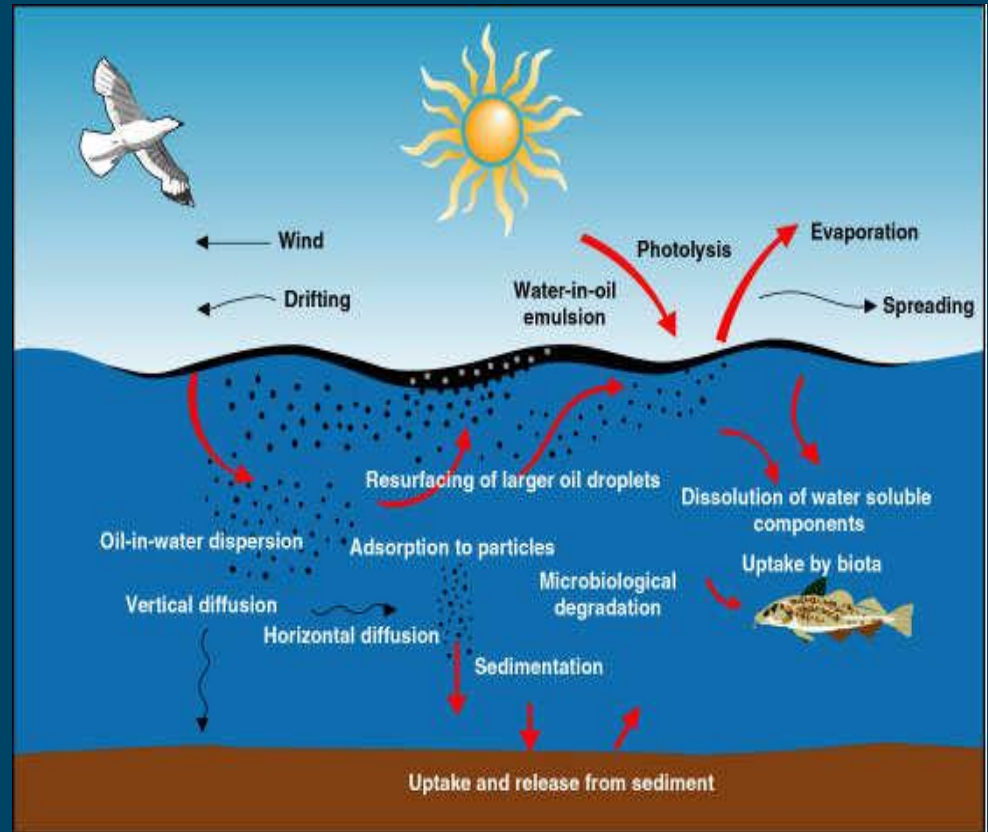
AMAP



Coastal Response Research Center

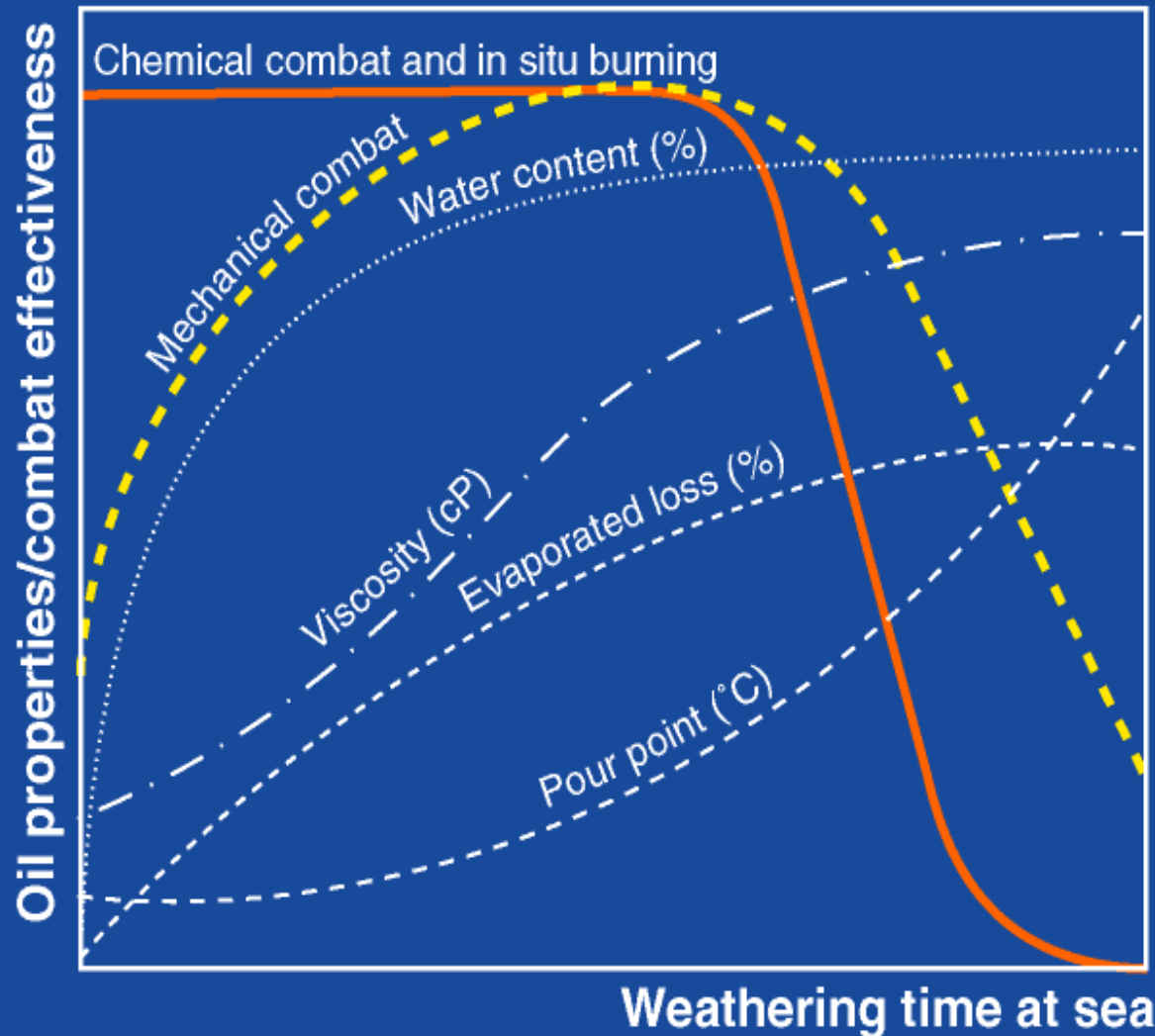
Weathering of Oil

- Natural Processes
- Function of Environmental Conditions
 - Temperature (H_2O , Air)
 - Wind
 - Oil Type
 - Currents, Tides



Weathering Properties at Sea

Important for Optimizing Response Operations



Fate & Behavior of Oil - Modeling

- Models of Oil in Cold and Ice-Infested Waters, In Ice and Under Ice are Rudimentary
- Hampered by Lack of Peer-Reviewed Cold Water and Ice/Oil Behavior Studies
- Need to Link Current 2D Spill Models to Brine Channel Models in Ice, 3D Mixed Layer
- Mass Transfer Models of Dissolution, Food Web Models for Fate



Toxicity Rates

- Acute and Chronic Toxicity
- Species Diversity
- Few Arctic / SubArctic Studies
 - Nominal concentrations issues
 - Complicated by dispersant issues
 - Current Alaskan JIP study
 - Barrow Lab Perkins et al.



Importance of Species

- Key Natural Resources
 - Role in food web
 - Threatened and endangered species
 - Economic importance
 - Cultural importance
- Arctic Species Are “Living on the Edge” and Changes Are Happening Quickly
 - Confounded by protracted exposure to oil
- Much of This Information is Poorly Known or Controversial for Arctic/SubArctic



Guiding Concepts I = Complexity

- Arctic Coastal Ecosystem = Complex & Dynamic
 - Action/reaction links
 - Interacting components = Water, Ice, Sediment, Shore, Air, Biota



Guiding Concept II = **Great Variability**

- Sea Ice Retreat/Absence = High Temporal & Spatial Variability in Coastal Processes & Human Activities
 - Daily, Monthly, Annually
- Variability in Currents, Wind, Weather, Anthropogenic Activity



Guiding Concept III = Great Uncertainty

- Poor Baseline Understanding of Arctic Coastal Processes
- Lack of Data with QC
- Exacerbated by Uncertainty about Rate/Scope of Climate Change



CRRC/NOAA ORR Arctic Initiatives



Coastal Response Research Center

Opening the Arctic Seas: Envisioning Disasters and Framing Solutions

- Workshop -March 2008
 - Goal: identify key strategies, actions and research needs so Arctic nations/communities can prepare for and respond to marine disasters
 - Participants: 7 Arctic states/3 indigenous nations, governments, NGOs, academia, private sector
 - U.S. and Canadian Coast Guard, Danish Navy



CRRC Workshop Key Findings

1. Designate ports of refuge
2. Control/track vessels
3. Strengthen multinational plans or create one Arctic agreement for all responses
4. Increase response training/logistical support for all stakeholders
5. Increase emergency response assets
5. Establish international Arctic response fund
6. Expand communications
7. Update weather and navigational charts
8. Improve ecological baseline information resources at risk
9. Research on oil behavior in cold water and spill response technologies



Opening the Arctic Seas

ENVISIONING DISASTERS AND FRAMING SOLUTIONS

Durham, New Hampshire
March 18-20, 2008

Report Issued: January 2009



- More **baseline information**
- More **resources** (NOAA has 1 SSC, no Damage Assessment Restoration personnel in Arctic)
- More **research** on better response approaches and better damage assessment & restoration

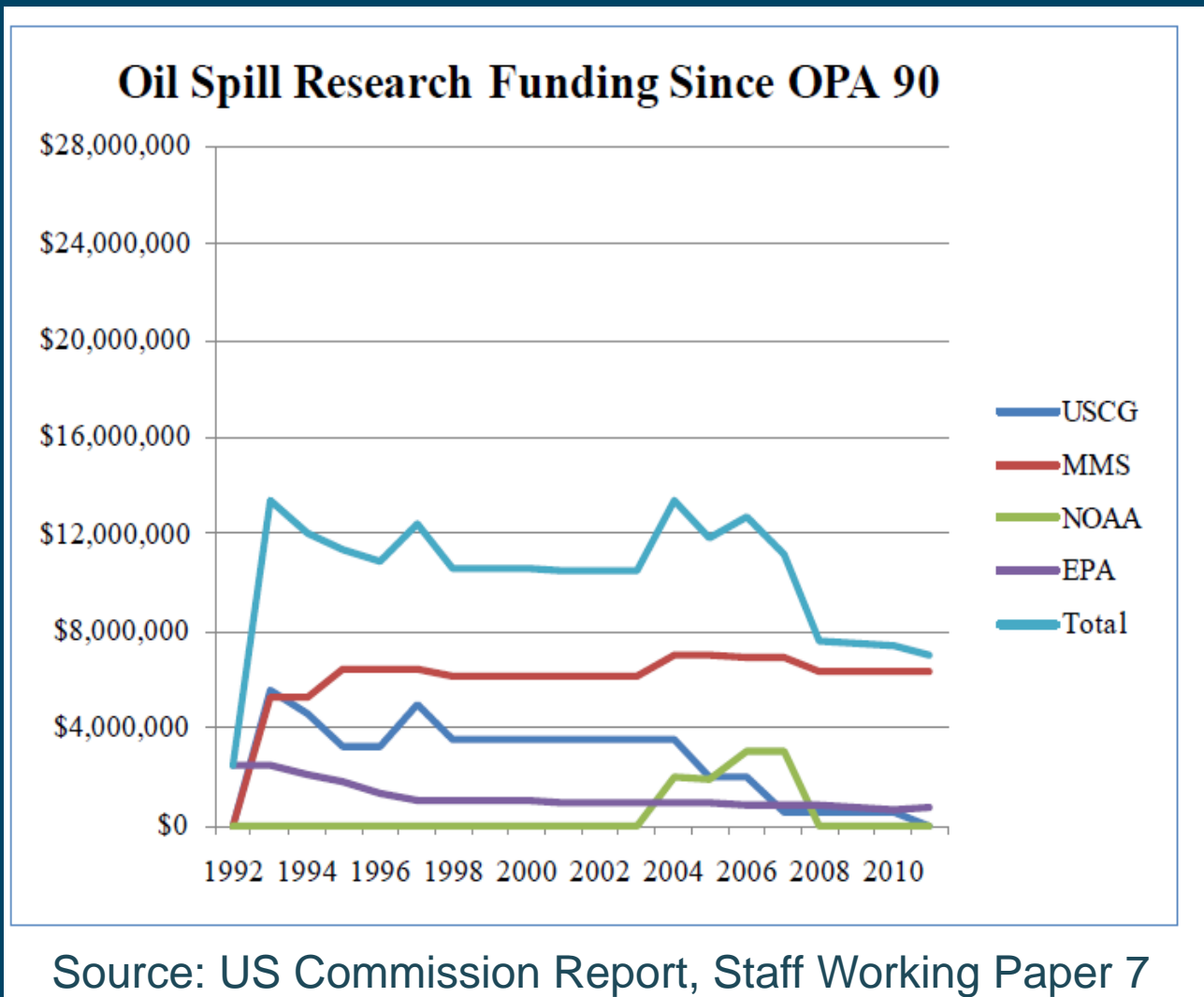
Photos courtesy of NOAA/Department of Commerce and UNH Center for Coastal and Ocean Mapping Science (part of HEALY 07-03) (Steve Roberts, Tom Balmer)



Coastal Response Research Center
at the University of New Hampshire



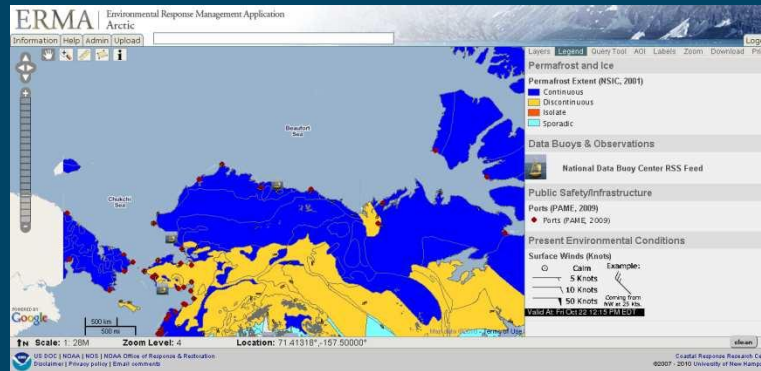
Oil Spill R&D Funding



Current Spill Response: Information Management

- Key is Rapid, Informed Decisions
 - Protect human health/safety
 - Consider human dimension issues (e.g., socioeconomic, cultural considerations, subsistence)
- Incident Command Needs Relevant Information in Easily Understandable Format





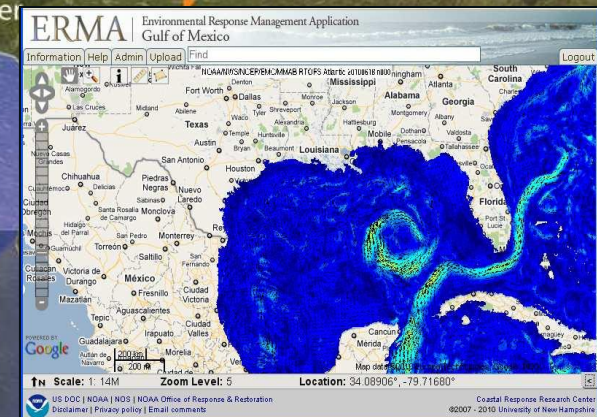
Arctic ERMA®: A Step Toward Preparedness

Environmental Response Management Application



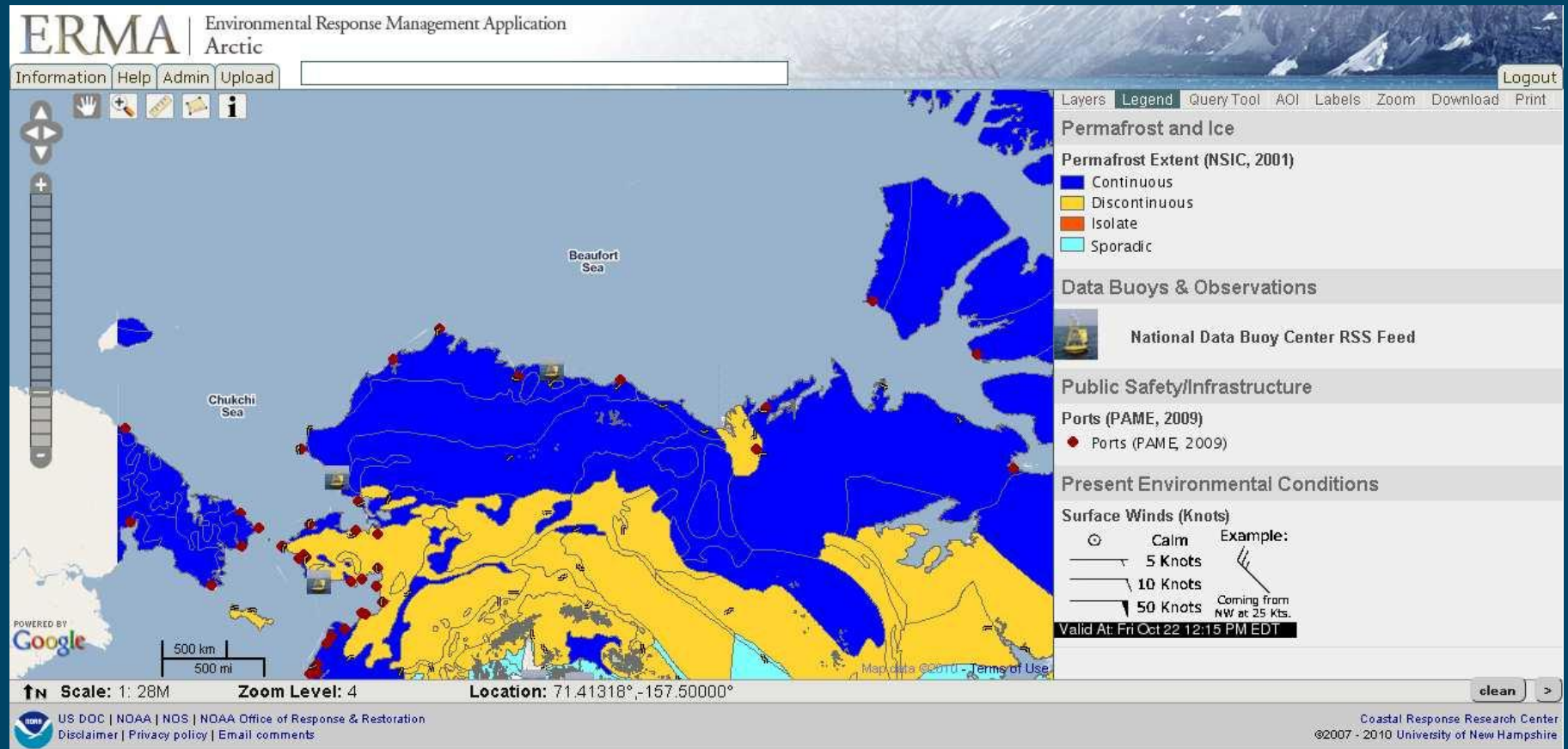


Environmental Response Management Application (ERMA)



Kurt Schwehr
CCOM/JHC

Existing Arctic ERMA® Footprint



Goals of Arctic ERMA®

- Represent area of significant activities
- Include international partners
- Integrate other GIS elements
- Leverage existing data/programs
 - Spill Planning - Emergency Response and NRDA
- Common Platform specifically focused on spill response
 - Designated Common Operating Picture for Deepwater Horizon spill



Arctic ERMA® Next Steps

- Prioritize data sets identified from April 2011 workshop
- Increase communications with Arctic Communities
 - Access to traditional knowledge
 - Mechanisms in place (i.e., data sharing agreements)
- Training: Drills and user training



CRRC Arctic Workshop on Natural Resource Damage Assessment (NRDA)

- Past emphasis Has Been on Response to Oil Spills in Arctic
 - Norwegian JIP
 - Coast Guard workshops
 - Industry efforts
- Some on Biological Impacts
 - CRRC JIP on biological effects
 - Shell-led JIP on biological effects



Impetus for CRRC NRDA Workshop

- Reality #1 = When (NOT IF) Oil Spill Occurs in Arctic
- Reality #2 = Substantial Amount of Oil Will Remain in Environment After Response
 - In spite of technological/equipment advances in response
- Reality #3 = Natural Resource Damage Assessment (NRDA) Will Be Initiated as a Result of Spill



Impetus for Workshop

- Reality #4 = NRDA Requires Much Better/ More Complete Knowledge of Arctic Marine Ecosystem Than We Have
- Reality #5 = Must Be Quick Injury Assessment and Rapid Implementation of Restoration in Arctic
 - Little Room for Delay Because Arctic Is Ecosystem on the Edge
- Reality #6 = Baseline Is Rapidly Shifting in Arctic Due to Climate Change
 - What is baseline?



Goals of NRDA Workshop: Apr 2010

- Initiate the Dialogue on Arctic NRDA
 - Among NRDA practitioners
- Identify Data Gaps in Understanding of Resources/Ecology at Risk from Spills
 - Temporal and Spatial
- Develop Rapport Among Stakeholders
 - CRRC's role in **bringing everyone to the table**
 - Better to initiate dialogue **before** spills occur



Arctic NRDA Workshop Outcomes

- CRRC Report on Workshop Including Recommendations on R&D and Way Forward
http://www.crrc.unh.edu/workshops/nrda_arctic/index.html
- Foundation for NOAA's NRDA Planning
- Working Group = Arctic Assessment
 - Continues dialogue
 - Coordinates efforts



Recommended Next Steps

- Establish a data clearinghouse
- Pre-plan for NRDA, including holding additional workshops
- Develop NRDA protocols and methods
- Identify Arctic restoration options
- Synthesize available baseline data and prioritize data gaps
- Begin/expand sampling for monitoring/reference areas



Alaska Joint Assessment Team

- Trustees, potential responsible parties, other interested stakeholders
- Goal: Enhance effectiveness and efficiency of NRDA through development of tools and products
- Objectives:
 - Develop and improve working relationships
 - Identify and address technical challenges of NRDA
 - Promote use of best available science in NRDA
 - Provide relevant guidance on conducting NRDA



Human Dimensions of Spills

- Human Dimension Issues
 - Communication
 - Valuing natural resources
 - Social impacts
 - Subsistence
 - Environmental ethics
 - Organizational (institutional) behavior



Current Spill Response: Human Dimension

- Indigenous Communities Have Strong Cultural Ties to Subsistence Fishing and Hunting
 - e.g., whales, seals, polar bears, pelagic fish
- Spiritual Oneness with Natural World
- Wealth of Local Knowledge about Coastal Environment
- Some Human Dimensions Research, Especially on Exxon Valdez, But More Needed
 - Arctic focus
 - Tools



Arctic Communities Working Group

- CRRC and NOAA are partnering with Alaska natives to bring all stakeholders in dialog
- Roundtable dialog facilitated by CRRC
- CRRC viewed as independent, honest broker
 - NH not energy producing state
 - Academic: trusted 3rd party
 - Reputation for playing this role elsewhere
 - Deepwater Horizon



Recommendations/Conclusions

- **Preparedness is KEY!!**
 - Response and NRDA
- Increased R&D funding fate/behavior, toxicity, ecosystem complexity & baseline
- Incorporate local knowledge & human dimensions
- Increase dialog among all stakeholders



For More Information

www.crrc.unh.edu



Major Issues from Workshop

- No central database of existing data
- Few long term studies; mostly in summer
- Lacking info on food-web impacts
 - Ice-associated; Marine mammals; Birds
- Basic environmental conditions lacking
- Local/indigenous resources need to be incorporated early and often
- Significant barriers to working in the Arctic
 - Logistics and funding

